

Deep UV Semiconductor Sources for Advanced Planetary Science Instruments, Phase II

Completed Technology Project (2009 - 2011)



Project Introduction

This proposal addresses the need for miniature, narrow-linewidth, deep UV optical sources that operate at very low ambient temperatures for use in advanced in situ planetary science instruments for non-contact detection and classification of trace amounts of organic, inorganic, and biogenic materials using Raman and native fluorescence spectroscopic methods. The sources include aluminum gallium nitride semiconductor lasers and ultra-narrow-linewidth transverse excited hollow cathode lasers emitting between 210 nm to 250 nm, a spectral range with demonstrated higher detection sensitivity and specificity than sources emitting at longer wavelengths. Applications include non-contact robot-arm or body mounted chemical imaging instruments and detectors for direct analysis of trace levels of chemical species containing C, N, H, O, S, Cl, on surfaces or as extractions from soil, rock, or ice. We have achieved the highest recorded deep UV semiconductor internal quantum efficiencies at wavelengths below 250 nm. But continuing difficulties of attaining laser emission and prospects for narrow line-width compatible with Raman applications has caused us to redirect a significant portion of the Phase II effort to another class of deep UV laser with a more proven UV Raman track record and the potential for miniaturization for robot-arm-mounted applications.

Anticipated Benefits

Potential NASA Commercial Applications: The deep UV source technologies being addressed by this proposal are immediately useful for Department of Defense (DOD) and Department of Homeland Security (DHS) applications as well as non-government commercial and industrial applications. DOD and DHS applications include in situ chemical, biological, and explosives sensors to detect trace levels of biological, nerve, and blister agents as well as low-volatility toxic industrial chemicals (TICs) and explosives at moderate standoff distances. In addition, a broad range of non-government commercial and industrial applications are addressed by the proposed deep UV sources including: environmental testing of water, soil and air; municipal and industrial water and waste-water quality testing; commercial product quality control testing of manufactured food, pharmaceutical, chemical, semiconductor, and other commercial products; clinical medical diagnostics instruments; and a wide range of research applications enabled by the core technologies developed on this program.



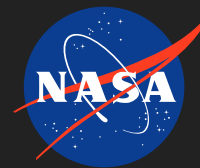
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for Advanced Planetary Science
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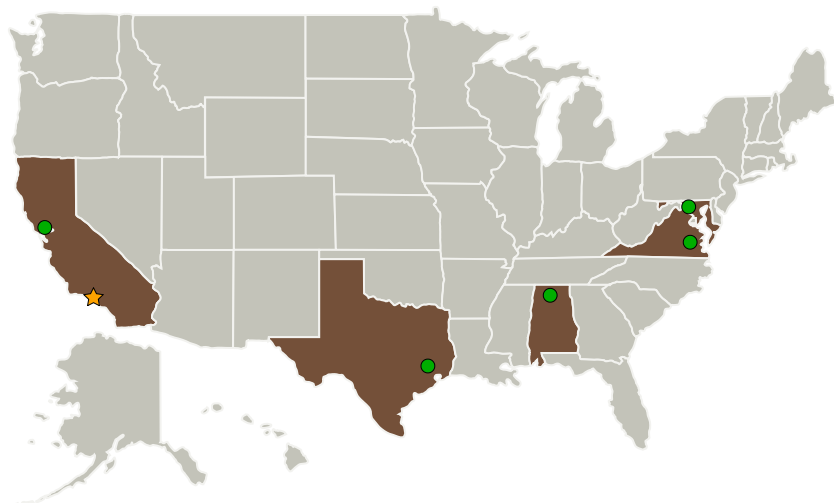
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama
Photon Systems, Inc.	Supporting Organization	Industry	Covina, California

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Gary C Jahns

Principal Investigator:

William Hug

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Primary U.S. Work Locations

Alabama	California
Maryland	Texas
Virginia	

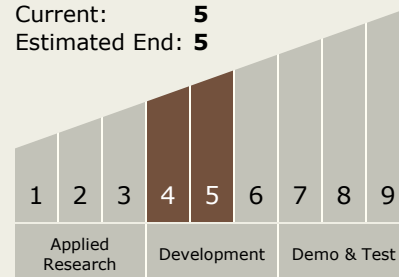
Project Transitions

**December 2009:** Project Start**December 2011:** Closed out

Closeout Summary: Deep UV Semiconductor Sources for Advanced Planetary Science Instruments, Phase II Project Image

Technology Maturity (TRL)

Start: **4**
 Current: **5**
 Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - TX08.1 Remote Sensing Instruments/Sensors
 - TX08.1.5 Lasers